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THE MYTH OF WORKSHARING

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The Myth of Worksharing^{*}

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Abstract

Worksharing is considered by many as a promising public policy to reduce unemployment. In this paper we present a review of the most pertinent theoretical and empirical contributions to the literature on worksharing. In addition, we also provide new empirical evidence on this issue, by a cross country analysis exploiting aggregate data for 13 OECD countries. The conclusions of the literature survey are indecisive. Conclusions about the efficacy of worksharing as an employment enhancing policy tool depend heavily on the setting in which the analysis takes place. Our empirical analysis does not find any evidence for the proposition that worksharing would promote employment or reduce unemployment. In an appendix we present an overview of recent public policy experience of European Countries with respect to different forms of worksharing. Also here the evidence is mixed.

JEL Classification: C33, E24, J2, J3

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1. Introduction

In public discussions the idea of worksharing often emerges as a potential instrument for reducing unemployment, or equivalently to increase the number of people in paid employment. The idea is usually based on the simple notion that in a given period a fixed amount of labor input required to produce a fixed volume of goods and services can be shared between persons who are already employed and those who are unemployed. It is argued that in this way a trade-off can be made between positively valued leisure of the employed and unwanted leisure of the unemployed. The idea appears to be particularly popular in Europe, but also in the US it has a venerable history.¹

However, economists as well as employers are mostly skeptical about the success of this policy prescription. The fallacy² of this seemingly simple idea is made clear in the literature especially by its impact on wages, wage costs, and output. In this study, we seek to provide a survey of the most pertinent theoretical and empirical contributions to this literature, and in addition provide new empirical evidence on the efficacy of worksharing in reducing unemployment or increasing employment. In section 2, we outline the most important factors determining the employment effects of a reduction in working time. In section 3, we present new empirical evidence based on a panel of 13 OECD-countries regarding the consequences of worksharing for employment. Final conclusions are drawn in section 4. In Appendix A, we add a brief review of some selected public policy experiments in European countries with respect to worksharing

2. A survey of the literature

One can distinguish different forms of worksharing. The three main ones are:

1. A reduction of the number of hours worked per time period, often denoted as “shorter

¹For example, during the height of the recession in 1933, Alabama’s senator Hugo Black introduced a bill prohibiting “interstate commerce in goods produced in ‘any mine, quarry, mill, cannery, work-shop, factory, or manufacturing establishment’ that worked its employees more than thirty hours a week” (Davis, 1979, p. 97). Of course, the Luddites destroying the looms that put them out of work were acting upon the same assumption that the total lump of labor was fixed and hence any labor saving technical progress would reduce employment.

² “The governments of France and Italy have lately proposed cutting their legal working week to 35 hours as a way to trim unemployment. To a lot of people this seems to make excellent sense. Why should so many workers complain about being overworked, when one in nine Europeans is idle? It is depressing that supposedly responsible governments continue to pretend to be unaware of the old ‘lump of labour’ fallacy: the illusion that the output of an economy and hence the total amount of work available are fixed”, (“One lump or two?” , *The Economist*, October 25th 1997).

hours”;

2. Early retirement of the currently employed;
3. Part-time work and job sharing.

We will discuss all three. Our discussion starts by concentrating on shorter hours, since this relatively straightforward case brings out many important issues. Once these have been addressed, it is easier to also discuss the other forms of worksharing.

2.1 Shorter hours

It is useful to mention at the outset that the two most important factors determining the success of worksharing are the direct effect on employment and the indirect effect via an induced wage change on employment. As will become clear in the discussion below, the effects of worksharing on wages and wage costs are controversial, and these largely determine the outcome of the worksharing policy. There are however several additional features which influence the outcomes, and these are discussed as well. These features show that the issue in question is quite complex and that the scope for worksharing may differ across countries and across industries within a country.

1. The structure of production

At the heart of any analysis of the possibilities of a successful implementation of worksharing lies a consideration of the structure of production. As a starting point for a discussion of the literature we borrow a model from Calmfors and Hoel (1988), which brings out some of the main issues at stake.

Consider a firm which produces output according to a production function with three factors of production: the number of persons employed (N), the number of hours these persons work (h), and the capital stock (K). That is, output (Y) is generated according to $Y = F(N, h, K)$. A more restrictive specification would be $Y = F(L, K)$, where L is labor input. The second specification is a special case of the first one, if L is taken to be a function of N and h . An instructive choice for the relation between L and h and N is: $L = G(h)N$. The function $G(\cdot)$ transforms hours worked into “efficiency units”. An obvious special case is where $G(\cdot)$ is the identity, i.e. $L = hN$. This may be a restrictive assumption, as it would require for instance that the productivity of workers is not affected by the number of hours per worker.

When $L = G(h)N$, the fact that the productivity of a worker is related to his or her working time is taken into account. Unless h is very large, it is reasonable to assume that G is an increasing

function of h , i.e. if more hours are spent on the job, labor input is bigger. For small values of h , not only G but also its first derivative with respect to h , G_h , may be small due to start-up time needed for any job to be done. If the number of hours spent on the job increases, the hours become more productive until an area of decreasing marginal productivity is entered, i.e. the second derivative G_{hh} becomes negative. For what follows, it is assumed that hours worked will be in this area. The function L can also be written as $L = g(h)hN$, where $g(h)$ gives the average productivity per hour of each worker, i.e. $g(h) = G(h)/h$. The assumptions on G and its derivatives translate into conditions on g and its derivatives as follows: if h is small g_h will be positive (average productivity per hour goes up with increasing hours), but when h increases g_h becomes negative (average productivity per hour starts falling).

With respect to capital services, it can be assumed that $K = lk$, where K = Capital services, l = operating time of the plant, and k = Capital stock. The number of shifts on the plant can be defined as $S = l/h$. Capital services can be assumed fixed (as in Calmfors (1985)), or variable (by varying the operating time of the plant l , as in Calmfors and Hoel (1988)).

For the moment we assume (still following Calmfors and Hoel (1988)) that the wage costs associated with an employee are given by the following wage schedule:

$$(2.1a) \quad W = a + w_0 h \quad \text{if} \quad h \leq h_0$$

$$(2.1b) \quad W = a + w_0 h + w_1 (h - h_0) \quad \text{if} \quad h > h_0$$

where W is the cost per worker, a is a fixed cost component and h_0 is the number of “standard hours” or “normal working time”. If the number of hours h is less than or equal to h_0 , a wage rate w_0 is paid. If the number of hours exceeds h_0 , a (higher) overtime wage rate w_1 is paid.

As noted in the introduction of this paper, the simplest motivation for worksharing is one where output is taken to be fixed, and one assumes that one can redistribute the amount of work necessary to produce the output among the currently employed and the currently unemployed. Let us start therefore with precisely this case. For a given level of output Y a firm tries to minimize costs. We also assume for the moment that capital is fixed and that worksharing does not affect the utilization of capital or the number of shifts needed. In this simple framework, cost minimization amounts to a choice of employment N and working time h such that total labor cost $C = WN$ is minimal under the restriction that $Y = F(g(h)hN, K)$ with Y fixed. It is straightforward to derive the first order conditions for cost minimization in this case. They are:

$$\begin{aligned}
(2.2) \quad & \frac{w_0}{W} = \frac{G_h}{G} \quad \text{for } h < h_0 \\
& \frac{w_1}{W} = \frac{G_h}{G} \quad \text{for } h > h_0 \\
& \frac{w_0}{W} \leq \frac{G_h}{G} \leq \frac{w_1}{W} \quad \text{for } h = h_0
\end{aligned}$$

We will provide successive interpretations of these conditions.

NG_h is the increase in labor input if h is increased by a small amount, whereas Nw_0 is the cost to the firm of this increase in labor input (for the case where actual hours are below standard hours). So G_h/w_0 is the increase in labor input per unit of money obtained by letting employees work longer hours. G is the extra labor input obtained by hiring one additional worker, while W is the associated cost to the firm. Hence, G/W represents the extra labor input per unit of money obtained by hiring an additional worker. The condition states that these two ratios have to be equal. This is entirely intuitive: if the condition would not hold, one could always lower costs by adjusting working time and the number of employees in opposite directions³.

For the second case ($h > h_0$) an analogous interpretation holds true. The third condition represents a corner solution. Since the marginal cost of additional hours changes discretely at $h = h_0$, we do not obtain an equality, but an inequality. Yet, the interpretation is very similar. It is not possible to lower cost by having employees work fewer hours and hire more workers or by doing the opposite.

We can use these conditions to analyze the change in demand for labor if the standard working time h_0 is being reduced. Clearly, if the optimal number of hours in the initial situation is below h_0 and remains below h_0 , a reduction of standard working time has no effect.

Consider the case where in the initial situation, i.e. before the reduction of standard hours, the firm required its workers to work overtime. To analyze the effects of this, first consider the ratio w_1/W :

$$\frac{w_1}{W} = \frac{w_1}{a - (w_1 - w_0)h_0 + w_1h}$$

³Of course, an equivalent way of interpreting the optimality condition is to say that the marginal rate of substitution between hours and workers has to satisfy the familiar condition that it equals the corresponding input price ratio.

Clearly, this ratio falls if we reduce h_0 . In view of our assumption on G_h , condition (2.2) implies that the number of hours worked will increase, and hence total employment N will fall. The reason for this result should be obvious. The reduction in standard hours has increased W , the price of a worker, but has left the price of an additional hour unaffected. In response to this change in relative price, the firm will use more of the input the price of which has not changed (hours), and will use less of the input the price of which has gone up (employees).

Next, consider the case of the corner solution, i.e. the case where initially all workers work standard hours. Since w_1 and w_0 are not affected by the fall in standard hours, whereas W increases, the ratios w_1/W and w_0/W will fall. It cannot be said *a priori* what the effect of a fall in standard hours will be. If the optimal solution remains a corner solution, then clearly the number of hours will fall and employment will go up. It is possible however, that it will become advantageous to the firm to require its workers to work overtime, in which case it cannot be said *a priori* what the employment effects of a reduction in standard hours will be.

In the case where initially actual hours were less than standard hours, conceivably the reduction in standard hours may move the optimum to the corner, or even to a situation where it is optimal to work overtime. Also in this case it is not possible to state *a priori* what the employment effects will be.

Finally, we notice (as do Calmfors and Hoel) that the strong result that worksharing reduces employment in the case where overtime is involved in the initial situation, depends on the assumption that overtime wages are constant. If overtime wages would go up, the more hours of overtime are put in, then the outcome of the analysis becomes ambiguous because the cost of an additional hour may become so high that it becomes more attractive to hire additional employees. Toedter (1988) lets the overtime premium increase (slowly) with overtime. Under his specification actual hours move in the same direction as standard hours. Yet, also in his analysis the effects of shorter hours on employment remain ambiguous, as they depend on additional conditions.

The available empirical evidence on the reaction of actual hours to a change of standard hours seems to indicate that actual hours follow standard hours, though possibly not completely. Hunt's (1996) empirical work on the micro-data of GSOEP (The German Socio-Economic Panel) suggests that at least for "Arbeiter" (hourly workers) in manufacturing a one-hour fall in standard hours led to a fall in actual hours of between 0.85 and 1.0. De Regt (1988) finds that a 1% reduction in standard hours reduces actual hours by 0.89% for the Netherlands over the period 1954-82, whereas according to Hart and Sharot (1978) a 1% reduction in the standard hours for the UK over

the period 1961-72 resulted in a 0.92% reduction in actual working hours. Kalwij and Gregory (1999) find that the elasticity of actual working hours with respect to contractual hours is close to 1 for Britain over the period 1975-1998. Thus, actual hours appear to be moving in the same direction as standard hours. If output is fixed, this implies a positive employment effect.

Although the assumption of exogenous output may be appropriate for some firms in the public sector (or for the government), it certainly is not appropriate for the vast majority of private firms. If we assume that firms aim at profit maximization, then an increase in labor cost entailed in a standard working time reduction leads to a “scale effect” which reduces total output and total labor use⁴. Thus, *in addition* to the effects discussed above, we now find a negative effect of worksharing on employment.

Calmfors and Hoel (1988) consider some additional cases, where the firm may now also vary its operating time. The employment results of worksharing remain ambiguous.

So far, the analysis takes wages (but of course not total wage costs) as given. Yet, the interaction of hours and wages will be seen to be of prime importance for a further evaluation of the employment effects of worksharing.

2. *Worksharing and wages*

To set the stage, let us first consider a model introduced by Calmfors (1985). Regarding employer behavior his model is rather similar to the model by Calmfors and Hoel (1988) introduced above. The major simplification is that the wage schedule is now flat, i.e. no distinction is made between normal hours and overtime, and hence all hours are paid at the same rate w . For the discussion below, this is not very important. The employer’s attempt to maximize profits will again lead to a demand for workers as a function of wages and exogenously set hours:

$$(2.3) \quad N = N(w, h)$$

Under reasonable assumptions one can establish that employment will fall if wages rise: $N_w < 0$. The effect of the number of working hours on employment is once again uncertain, i.e. the sign of N_h cannot be determined without further specific assumptions.

In the model it is assumed that there is one union with monopoly power who sets wages, while

⁴ See Calmfors and Hoel (1988) for the derivation of this result.

balancing the goals of high wages and the risk of unemployment. Given the wage set by the union, firms then decide on employment according to (2.3) above. The union is assumed to maximize the average utility of its members (both employed and unemployed). The utility of an individual worker is $V=V(c,h)$, where c is consumption. For employed workers this implies that utility is given by $V=V(wh,h)$, whereas for unemployed people utility will be $V(b,0)$, where b is an unemployment benefit. Thus, the union will maximize

$$\frac{N}{M}V(wh,h) + \frac{M-N}{M}V(b,0)$$

where M is the total number of members of the union (or the total number of workers), and hence $M-N$ is the number of unemployed members (or unemployed people). Maximization of this objective function with respect to the wage rate w subject to (2.3) yields the optimal wage rate for the union. The first order condition for a maximum is

$$f \equiv NhV_c + N_w[V(wh,h) - V(b,0)] = 0$$

where subscripts indicate partial derivatives.

From this one can derive the response of wages to hours:

$$\frac{dw}{dh} = -\frac{f_h}{f_w}$$

It can be established that f_w is negative. Thus, the sign of the expression depends on f_h . It turns out that the expression is quite complicated and can only be signed in special cases.

If we now sum up what we can say about the total effect of a reduction in hours on unemployment, we note that the total effect of shorter hours on employment can be decomposed into a direct effect and an induced effect:

$$(2.4) \quad \frac{dN}{dh} = N_h + N_w \frac{dw}{dh}$$

On the right hand side of this expression, only N_w is unambiguously negative. The other two components cannot be signed, and thus without further assumptions we cannot say what the employment effect of a reduction in working time will be.

Calmfors (1985) also considers some special cases, e.g., the one most favorable for effective worksharing is where employment and working time are perfect substitutes, i.e. $L=hN$. The conclusion remains that the net effect on wages of a cut in hours is ambiguous. In addition, he considers the possibility that the initial situation does not conform to an optimum for the trade union. For the same special case with perfect substitutability between hours and employees, he concludes that if initial working time is optimal or smaller than optimal for the trade union, the wage per unit of time must always increase in response to an exogenously imposed reduction in working hours⁵. If initial working time is larger than optimal for the trade union, the wage may increase or decrease as a result of a reduction in working time.

In order to obtain some more insight in the likely wage effects of shorter hours, it would be helpful if we would know more about the likely size of the components in (2.4). Houpis (1993) expresses (2.4) in elasticity form as

$$(2.4') \quad \epsilon_{N_h} = \epsilon_{N_h} + \epsilon_{N_w} \epsilon_{w_h}$$

where ϵ_{N_h} is the *total* elasticity of employment with respect to hours, ϵ_{N_h} is the *partial* employment elasticity with respect to hours (i.e. assuming fixed wages), ϵ_{N_w} is the employment elasticity with respect to wages and ϵ_{w_h} is the wage elasticity with respect to hours. Houpis first provides a survey of studies which have computed ϵ_{N_h} and reports that a sensible range of the estimates of ϵ_{N_h} is from -0.5 to -0.8.

The rest of the paper considers a number of models that may shed light on the sign and magnitude of ϵ_{w_h} . These models include monopoly union models, models in which unions and employers bargain over wages but not employment ("right to manage models"), general equilibrium models, efficiency wage models, and models with overtime. The author argues that in many of these cases there is no reason to expect ϵ_{w_h} to differ appreciably from zero. In many cases this conclusion is dependent on whether before a change in hours, individual employees are at an optimum or not. Not surprisingly, if before the policy change employees work more than their

⁵ This is of course not surprising. In this case, shorter hours moves the union (farther) away from its optimum and hence it requires additional compensation.

optimum at the given wage rate, a fall in hours need not imply an increase in wages⁶. Clearly, if we can assume w/h to be close to zero, then the second term in (2.4') can be ignored and the first term (which was estimated to be between -0.5 and -0.8) dominates. This would imply a positive effect of an hours reduction on employment.

Booth and Schiantarelli (1987) use the same model as Calmfors, but make specific assumptions about the production function (Cobb-Douglas) and the utility function of workers (Stone-Geary) and try to use empirical evidence from the literature to establish reasonable parameter values. On the basis of this calibration of their model, they conclude “that the employment effect of a cut in hours is more likely to be negative”. They also look at several variants of the model, including dynamic ones, and efficient bargaining models, where unions decide on both wages and employment. Their overall conclusions remain the same: most likely shorter hours induce higher unemployment.

A somewhat different variant is due to Booth and Ravallion (1993) who employ a framework very similar to that of Calmfors and Hoel (1988), but they abstract from overtime. Their production function is of the form $F(g(h)hN)$, with both F and g assumed to be strictly concave. F is monotonically increasing, but g may be decreasing beyond a certain number of hours. Ignoring the possibility of overtime payments, but allowing for fixed costs per employee, the firm maximizes

$$p(w, h) = F(g(h)hN) - (a + wh)N$$

with respect to N . Thus wages and hours are taken to be exogenous to the firm. The first order conditions for a maximum are:

$$(2.5) \quad F'[g(h)hN]g(h)h = a + wh$$

Now consider an exogenous change in h and allow for a possible change in w as a result of this. Then implicit differentiation of (2.5) with respect to h yields the following response of employment to the change in hours:

⁶ We will discuss some empirical evidence on the relation between hours and wages below.

$$(2.6) \quad \frac{\partial \ln N}{\partial \ln h} = e \left[1 + \frac{\partial \ln w}{\partial \ln h} \right] - \left(1 + \frac{e}{w} \right) \left[1 + \frac{\partial \ln g}{\partial \ln h} \right]$$

where

$$e = \frac{\partial \ln N}{\partial \ln w} < 0; \quad w = \frac{wh}{a + wh}$$

i.e., e is the wage elasticity of labor demand and w is the share of variable labor cost in the wage bill. Clearly the right hand side of (2.6) is negative (and hence a cut in hours increases employment) if the following (sufficient) conditions are met:

$$(2.7a) \quad \frac{\partial \ln w}{\partial \ln h} \geq -1$$

$$(2.7b) \quad \frac{\partial \ln g}{\partial \ln h} \geq -1$$

$$(2.7c) \quad -e < w$$

Condition (2.7a) says that a cut in hours should not increase unit labor costs; condition (2.7b) says that a cut in hours should reduce output at a given employment level; condition (2.7c) says that the absolute wage elasticity of labor demand should not exceed the share of variable labor costs in the total wage bill. This condition is referred to as the “elasticity-share test”. The authors show that conditions (2.7a) and (2.7b) are satisfied in an efficient bargaining model (in which unions and employers bargain over both hours and wages). Thus if in that case the government would next impose a cut in hours, the elasticity share test would determine if this increases or decreases employment. On the basis of aggregate evidence for the UK and Australia it is found that in the UK the elasticity share test would imply a positive effect of a cut in hours on employment. For Australia the results are ambiguous. The disaggregated results for Australia show that in seven out of 12 industries the employment will increase as a result of a cut in working hours (when wages and hours have been bargained efficiently).

In the monopoly union model, the elasticity share test is no longer a sufficient statistic determining the success of a cut in hours.

A number of other authors have investigated the effect of shorter hours on wages. Hunt (1996) uses the micro-dataset of the German Socio-Economic Panel (GSOEP) to analyze the effect of the reduction in standard working hours which were achieved by trade unions in (West) Germany starting from 1985. The author finds that although the reduction in *standard* working hours led to a fall in *actual* working hours (see above), the fall in earnings is almost fully compensated for by a rise in hourly wage. These results are inconsistent with the hypothesis that standard hours reductions are accompanied by wage restraint (as argued by Houpis (1993)). On the basis of a macro time series model using quarterly data for German manufacturing from 1970-1989, Franz and Smolny (1994) find that in certain industries hourly wages rose as a result of a reduction in standard hours but by and large workers are only partly compensated for the shorter working week. Nymoen (1989) uses quarterly Norwegian manufacturing data and finds a strong short-term effect of standard hours on wages (the possibility of a full compensation in earnings for the fall in hours lies within the 95% confidence interval of the estimated parameter), but in the long run the effect disappears. Holmund and Pencavel (1988) find a positive effect of a reduction in hours on wages, using Swedish data for the manufacturing and mining sector.

Estimates by Dur (1997) for the Netherlands show a significant effects a reduction in the number of contractual hours on wages. He finds that a 1% reduction in working time will increase the hourly wage by about 0.45%.

Obviously, the results of Dur (1997) and Hunt (1996) contrast with the results presented in Houpis (1993) who believes that (hourly) wages are not likely to rise as a result of a reduction in working hours. Also Freeman (1997) discounts the possibility that wage demands from trade unions are the principal reason for the minimal effect of worksharing policies. This is because most trade unions recognize that a demand for full compensation of the reduction in working hours makes worksharing costly and potentially counter-productive. He refers to the fact that at least in some countries where the worksharing policy is pursued (for instance Belgium and the Netherlands) wage restraint is generally viewed as a necessary component of worksharing agreements. Altogether, the evidence (and opinions) on the wage effects of shorter hours appears to be mixed.

A tack different from the one in the papers discussed so far, is taken by Hoel and Vale (1986). Rather than considering a union with monopoly power, they look at the other extreme, where there are no unions and firms set wages unilaterally. Taking capital and other production factors as given, a firm's production function is given by $Y=F(L)$, where Y is output and L is labor input. The specific feature of this paper is the definition of labor input:

$$L = (h - tq)N$$

As before, N is the total number of employees; t is the training cost of a new employee, and q is the number of employees quitting per period (so that they have to be replaced by new employees who require training). Hours worked h is set exogenously by a policymaker. The quit rate q is taken to be a function of the wage paid by this firm relative to the wage paid by other firms and of the unemployment rate, i.e.

$$(2.8) \quad q = q\left(\frac{w}{w^*}, u\right)$$

where w^* is the average wage paid by other firms and u is the unemployment rate.

In this setup shorter hours will make labor less productive. This shifts the first order condition for profit maximization by an individual firm in the direction of higher wages, since thereby the firm can reduce the number of quits. However, *all* firms will do this, and hence w^* will rise proportionally with w , so that in the end the number of quits is not affected by the across-the-board wage increase. The only thing left, according to (2.8), to reduce quits is a higher unemployment rate. Thus the authors show that shorter hours will have two effects: higher wages and higher unemployment. Of course, one can make alternative assumptions regarding the nature of the training costs. If for instance training costs are proportional to hours, the results obtained here will no longer apply (cf., e.g., Houpis (1993)).

A somewhat related argument also stressing the importance of initial training costs of new employees, is advanced by Riechel (1986) who observes that capital intensive (labor-saving) investments entail higher initial training costs than labor-intensive investments, and as a result the marginal cost of new employment is higher in comparison to the marginal cost of additional hours worked by persons already employed. Therefore, laborsaving investments would be detrimental to a worksharing policy. His econometric results indicate that in the Netherlands during the period 1970-78 the trend was towards laborsaving investments. However, the high and prolonged degree of wage restraint in the Netherlands has affected the relative price of labor, and as a result there has been a sharp decline in the laborsaving investment for the subperiod 1980-84.

As a third mechanism affecting wages, one can consider the case where initially shorter hours

reduce unemployment. If a reduction in working hours would boost employment, a conventional Phillips curve argument would imply an increase in wages which in turn reduces employment. A similar argument is advanced by Layard, Nickell, and Jackman (1991). They argue that the reduction in working hours creates an inflationary pressure by (initially) reducing unemployment. Since the changes in working hours do not effect the mix of unemployment and inflation which the government prefers, it is very likely that the government allows unemployment to rise again in order to control inflation. According to the authors: “the net result of shorter working hours is then no reduction in unemployment, but a reduction in output”.

3. Institutional rigidities in the labor market

In addition to the wage-costs and implications for productivity, there may also be institutional features of the labor market which indirectly influence the success of a worksharing policy. The most notable ones are rigid labor laws, inflexible work arrangements, and slow administrative and labor litigation procedures. These rigidities may make it unattractive for the employer to hire new employees, even if the current employees work fewer hours per week. Many of these features have effects similar to the fixed wage costs or the initial training costs in the models discussed above. Since the fixed costs of hiring new employees form one of the main reasons why firms may prefer to have employees work longer hours rather than hire new employees, alleviation of labor market rigidities may be an effective way of increasing employment, without invoking any specific worksharing arrangement. As to the unemployed, their willingness to accept a job will partly depend on the wage they can earn in employment relative to the benefits they may be receiving. If the number of standard hours is reduced, and this is accompanied with a lower weekly wage, the attractiveness of finding a job may fall, unless benefits are lowered simultaneously. It may thereby become more difficult for firms to find new workers, which then possibly translates into higher wages. This in turn depresses employment.

4. Heterogeneity

The characteristics of the unemployed are also an important factor in making worksharing successful. Especially in situations where the duration of unemployment is long, the unemployed may have lost some of their skills, which reduces their productivity. It does not even matter whether the lower productivity of the unemployed is real or only perceived by firms; in both cases there will be a negative employment effect. This can be seen most easily by referring to the model of Calmfors

and Hoel (1988). Consider the case where a firm would want to respond to shorter hours by hiring new employees. If the new employees are perceived to be less productive than the current ones, this is equivalent to a situation where their wages would have to be higher. The firm will find itself then in a corner solution, and the firm may very well end up requiring its employees to work longer hours (or reducing output), rather than hiring new employees. Similarly, if the unemployed are perceived to require more training than the current employees before they can attain the same productivity level, this affects the fixed costs in the wage schedule (2.1), and again the effect on employment is unambiguously negative.

So far, we have implicitly assumed that all workers are homogeneous, i.e. their skills are identical or differ only in level, not in type. This implies that we can easily substitute workers for one another. Of course, this is not true. Different people have different types of skills and an organization usually combines workers with different types of skills in some (optimal) way.

To the extent that the unemployed are different from the employed, what matters is whether their skills are complements or substitutes. Suppose for instance that most of the unemployed are unskilled and that skilled and unskilled labor are complements. It is then conceivable that a reduction in work time of skilled labor actually decreases the demand for unskilled labor and therefore for the unemployed. This point was made by Freeman (1997). Freeman suggests that one of the principal reasons for a limited success of a worksharing policy lies in the difference between the skills of unemployed and employed persons.

5. Labor supply responses

In the situation where a reduction of standard hours is accompanied by a fall in income, and the household has a preference for income over leisure, the reduction in the official working time of one household member may increase the labor supply of other household members.⁷ The ultimate decision will depend not only on labor supply preferences of different members, but also on work opportunities and the structure of labor demand (such as flexibility in the working time). If there are constraints on extending the working time of persons already employed, additional members of the household may start looking for work, i.e. there will be an “added worker effect”. Riechel (1986) reports on high growth in the participation rate of women and in the preparedness to work overtime in the Netherlands during the period in which income losses were observed. In the author’s

⁷ Alternatively, the household member whose hours are cut may start looking for a second job. Multiple job holdings are particularly prevalent in the US, but also in Europe the number of people holding more than one job appears to be rising.

view this trend suggests a substantial added worker effect. Kooreman and Kapteyn (1985) have investigated the interaction of labor supply of spouses in the context of a household labor supply model. In a simulation of the effects of a mandatory reduction of hours worked by the male partner in a household, it is estimated that the hours worked by the female partner will increase just enough to maintain the previous level of household income. This is consistent with Riechel's observation. Moreover, as female wage rates are generally lower than male wage rates, the additional number of hours worked by the female in the household will on average be more than the reduction in hours by the male.

Preferences for work versus leisure may differ across countries. Bell and Freeman (1994) find for instance that Germans work considerably fewer hours than Americans, *and* that Americans are more likely to prefer more hours of work, whereas the Germans are more likely to prefer fewer hours of work. What holds true for the Germans probably holds true for most of the European Union countries in general.

Freeman (1997) also mentions the labor supply response as a main reason behind a limited success of worksharing policies. He mentions the fact that real wages have been stagnant or falling for large segments of the US work force, and a restraint in wage growth is observed in the 1990s in most countries in Europe. Given these trends, it is less likely that the workers will be willing to engage in a worksharing scheme. He also refers to the subjective opinions of the workers to support his argument. In 1985, almost 93% of all workers in the US desired the same or more hours of work and earnings, and in 1989 about 56% of all Europeans preferred an increase in pay compared to 34% who preferred shorter working hours.

2.2 Early retirement, part-time work and job sharing

1. Early retirement

The idea of early retirement, of course, is to replace older workers by younger ones. Referring to the framework of Calmfors and Hoel (1988), one might suspect two major differences. First of all, older employees often receive a higher wage than younger ones. Replacing older employees by younger ones then reduces the total wage cost per employee, but also the marginal wage cost of an additional hour. On the other hand, subsuming training costs, and perhaps the present discounted value of severance pay, under fixed costs raises the wage cost per employee. In total, then we have an ambiguous effect on the wage cost per employee and a negative effect on the wage cost per hour of the new employees. The firm faces the choice to either hire a young replacement of the retired

employee or to require its remaining workers to work more hours. In the situation sketched here, the decision to hire a new young employee will mainly be driven by the total wage cost of such an employee. One should note that if early retirement is encouraged jointly with a policy of shorter hours, this works against the replacement of older workers by younger ones, as the higher fixed costs of the younger workers weigh more heavily in a situation with shorter hours. Without going into much detail, it would seem that also here the employment effects of early retirement are ambiguous.

In terms of macro- or wage effects, any initially favorable effect of early retirement on unemployment that does not shift the natural rate of unemployment (the NAIRU) will leak away through a more strict anti-inflation policy. If some workers retire early, and the number of jobs remains unchanged, inflationary pressure will rise. Since the government is expected to choose a similar mix of inflation and unemployment as in the period before the early retirement program, the unemployment rate will revert to its former level. The net effect of the early retirement program will be a reduction in output and the number of jobs in the economy. Layard, Nickell and Jackman (1991) also provide a graphical illustration of a possible relationship between an increase in early retirement and an increase in unemployment for the period 1975-1989. The countries that have experienced growth in early retirement (the United Kingdom, the Netherlands, France and Spain) are those with the highest increase in unemployment over the period considered. Of course, such cross sectional relationships do not tell us anything about the direction of causality. We return to this issue in the next section.

An additional consideration may be the following: if early retirement benefits are generous (as they tend to be, in order to induce as many older employees as possible to exit early) their financing becomes a problem. Generally, early retirement is financed by some form of pay-as-you-go system. Thus if many employees retire early, this raises taxes on labor and hence raises the wage costs to the firm. This in itself depresses labor demand.

2. Job sharing and part-time work

Job sharing involves splitting a full-time position into two or more part-time positions, while retaining all the rights and privileges which are normally provided with the full-time jobs. In some countries, job sharing can be distinguished from traditional part-time work for the fact that part-time jobs do not always provide the same terms and conditions as full-time jobs. In most countries, partly as a result of recent efforts by governments and trade unions to remove differences between

part-time and full-time work, job sharing and part-time work can be treated analogously. Job sharing and part-time work are also used in combination with other flexible work systems, such as a partial (early) retirement in which older workers share their jobs with younger workers.

The most often quoted advantages of job sharing and part-time work include improved productivity, access to a wider range of skills and a larger pool of potential full-time employees, reduced absenteeism and greater training opportunities for younger people. These schemes also have potential disadvantages, including administration costs, coordination problems (particularly in job sharing), divided responsibilities and time delays. Some employers believe that part-timers are less committed to their jobs than are full-time employees (as noted by Roche et al. (1996)). In principle, the employment effects of this policy are similar to those of shorter working hours. Unless part-time work is associated with lower wages, one may again expect the wage costs of part-timers to be higher than those of full-timers and hence the employment effects of such a policy will be ambiguous.

Drèze (1985) notes that job sharing in Europe has not developed as a policy instrument to deal with unemployment, nor that it has spread among men (with the exception of early retirees). A high incidence of part-time work is in general associated with an above average rise in the participation rate of women, which indicates that promoting part-time work and job sharing may also increase the participation of women in the workforce and as a result unemployment may not fall.

3. Empirical analysis

The principal aim of the empirical analysis is to study whether or not employment is affected by a reduction in working hours in the long run. As has become clear in the previous section, various studies have been undertaken to assess the employment effects of worksharing. Generally, these studies are of a partial nature. One either looks at particular sectors or firms and tries to establish whether jobs have been created or saved, or one considers particular aspects, e.g. whether wages have risen as a result of worksharing. The sector or firm studies are incomplete in the sense that there are several mechanisms involved that cannot be taken into account. For instance, in a firm study one has to abstract from the effects of worksharing in this firm on employment in other firms.

Since potentially the effects of worksharing are so complicated and wide-ranging, the

natural way to study these effects is by looking at whole economies. For this reason, the empirical analysis is based on a comparison of economies over time and across countries. By looking at an aggregate level, one can accommodate several of the feedbacks and secondary effects that cannot be dealt with by analyses at the firm or sector level. The consideration of particular aspects, such as wage effects, is useful to gain insight in the importance of certain mechanisms, but clearly they will also not tell the whole story. As discussed in the previous section, worksharing may affect production and inflation. The empirical analysis does not take these effects into account and, in this respect, has to be considered a partial analysis. Keeping this caveat in mind, the empirical analysis does provide insight in the long run affects of worksharing on wages and employment and the central role of wages in the relationship between employment and working hours. Hereby taking full account of the simultaneity between employment, wages and hours.

The outline of this section is as follows. Section 3.1 describes the data. Section 3.2 formulates the empirical model and Section 3.3 presents and discusses the estimation results.

< Table 1 >

3.1 Data

Annual data has been gathered on employment, working time, wage rates, Gross National Products (GNP), Consumer Price Indices (CPI), and demographic characteristics of the population for 12 OECD countries. The data cover the time period 1971-1994.

Statistics on employment, population size, GNP and the CPI are taken from the “International Financial Statistics” of the International Monetary Fund (IMF).⁸ Employment is defined as the number of persons in paid work or self-employment. The size of the population is a midyear estimate. The CPI is a Laspeyres price index of the cost of living.

Statistics on the size of the population between 15 and 64 years of age are taken from the “Employment Outlook” and “Labour Force Statistics: 1970-1993” of the Organization for Economic Co-operation and Development (OECD).

Statistics on wage rates and working time are hard to obtain. An important criterion is that the data must be consistent over time and across countries. Different data sources use different definitions of the wage rate or working time. Therefore, combining information from different data sources may lead to inconsistencies in the constructed data set. For this reason, statistics on the

⁸ This information has been obtained from DATASTREAM.

wage rates and working time are taken only from the publications of the International Labour Office (ILO). Working time is defined as the actual number of working hours per week of an average worker in the non-agricultural sector. It must be noted here that these data on working hours are not ideal for the purpose of this paper. Effects of worksharing as described in the literature are typically associated with contractual limitations on the number of hours worked. But reliable data on contractual hours is not available. However, as discussed in section 2, several studies, e.g. Hunt (1996) and Kalwij and Gregory (1999), find that the elasticity of actual hours with respect to contractual hours of work is close to 1. On the other hand, the data used refer to national averages of actual working hours and hence are not only influenced by such contractual limitations, but also, e.g., by the share of part-time workers in the labor force. We acknowledge the importance of this but incorporating part-time employment in the empirical analysis is beyond the scope of this section because of data limitations.

The wage rate is defined as before tax earnings per hour. ILO statistics on wages and working time are available for 12 OECD countries: the United States, Japan, Australia, New Zealand, Belgium, France, Germany, Luxembourg, The Netherlands, Portugal, Spain and the United Kingdom. However, not for all 12 countries information on wages and working time is complete. For Spain we have information on working time from 1977 up to and including 1992. For the United Kingdom we have no information on working time before 1973. Only for New Zealand and the United States statistics on wages and working time were available for the year 1994. The statistics for Germany were influenced by the reunification of East and West Germany and for this reason, only observations of West Germany up to 1990 are included. This leaves us with 266 observations.

Table 1 reports on the observation period per country. We did not find a data source that could complement the ILO statistics on wages and working time in a consistent way. All information on earnings in the ILO are nominal and in national currencies. We use the CPI to convert the nominal wage rate into a real wage rate. In the empirical analysis a logarithmic specification together with the country-specific effects will control for differences in purchasing power.

In Figures 1 to 6 the variables used in the empirical analysis are shown for each of the 12 countries. These variables are, respectively, employment rate, real hourly wage rate (indexed, 1990=100), average number of hours of work per week, real GNP per capita (indexed, 1990=100), consumer price index (1990=100) and share of the population between 15 and 65. The employment

rate has gone up in the United States and, during the eighties, in the Netherlands and the United Kingdom. The real wage rate has gone up for all countries with the exception of the United States. Working hours per week have fallen in most countries. In Spain and France the decreases have been largest during the seventies. Real GNP per capita is generally rising. The share of the population between 15 and 65 has gone up for most countries but the time-pattern is clearly different across countries.

3.2 Econometric Model

As discussed in section 2, the real wage rate plays a central role in the relationship between working hours and the employment rate. A reduction in working hours may cause an increase in the real wage rate and, consequently, reduce or even neutralize the presumably positive direct effect of a reduction in working hours on the employment rate. Furthermore, it may be the case that a low level of employment triggers a policy of reducing working hours, i.e. we have to worry about reverse causality. Given these considerations, we take fully into account the interrelationship between the employment rate, the real wage rate and working hours. To be able to identify the long-run elasticities we include in our analysis the real Gross National Product (GNP) per capita, the Consumer Price Index (CPI) and the share of the population between 15 and 65 years as exogenous explanatory variables. In the empirical analysis a logarithmic transformation is applied to all six variables and for convenience we refer to these transformed variables as Employment rate, Wage rate, Working hours, GNP, CPI, and Share 15-65.

Let us assume that a long-run relationship between the vector of endogenous variables Y_{it} and the exogenous variables Z_{it} exists and is given by:

$$(3.1) \quad (I - \Phi_i)Y_{it} = \Theta_{0,i} + \Theta_i Z_{it} + U_{it} \quad i = 1, \dots, N, \\ t = t_i^0, \dots, t_i^T.$$

Y_{it} is a vector containing Employment rate, Wage rate and Working hours in period t of country i , and Z_{it} is a vector containing GNP, CPI and Share 15-65 in period t of country i . N is the number of countries and T is the number of time periods. U_{it} is a vector of error terms which is assumed to be independent across time and countries. The parameters of interest are the elements of Φ_i and Θ_i and are interpreted as long-run elasticities since we use a logarithmic transformation of all variables

in the system. Φ_i is (3x3)-matrix with zeros on the diagonal, $\Theta_{0,i}$ is a (3x1)-vector of intercepts, and Θ_i is a (3x3)-matrix. Several elements of Θ_i are set equal to zero to satisfy the rank and order conditions for identification (see, e.g., Davidson and MacKinnon (1993)). We return to the issue of identification below.

At this stage it is convenient to write down the long-run relationship between a single endogenous variable (denoted by y_{it}) and the remaining two endogenous and the exogenous variables (denoted by X_{it}) as follows:

$$(3.2) \quad y_{it} = \mathbf{q}_{0,i} + X_{it}' \mathbf{q}_i + u_{it} \quad i = 1, \dots, N, \\ t = t_i^0, \dots, t_i^T.$$

There is, of course, a one to one correspondence between the parameters in equation (2) and the parameters in equation (3.1). The variables included in equation (3.2) may be non-stationary but are assumed to be cointegrated.⁹ This means the error term u_{it} is assumed to be stationary.

The data generating process is taken to be an AutoRegressive Distributed Lag model (ARDL(p,q)):

$$(3.3) \quad y_{it} = \mathbf{m}_i + \mathbf{g}_i' t + \sum_{j=1}^p \mathbf{l}_{ij} y_{it-j} + \sum_{j=0}^q \mathbf{d}_{ij}' X_{it-j} + \mathbf{e}_{i,t} \quad i = 1, \dots, N, \\ t = t_i^0, \dots, t_i^T.$$

The error terms are assumed to be independently distributed across time and countries. The distributed lag orders on y_{it} and X_{it} , i.e. the values of p and q , are chosen in such a way that the error terms are independent across time, i.e. the errors terms are serial uncorrelated. Equation (3.3) can be written in an error-correction equation from which we can identify both the long and short run effects:

$$(3.4)$$

⁹ An excellent discussion on the issues of identification of long run effects and cointegration is found in Hsiao (1997).

$$dy_{it} = \mathbf{m}_i + \mathbf{g}_i t + \mathbf{f}_i (y_{it-1} - \mathbf{q}_i' X_{it}) + \sum_{j=1}^{p-1} \mathbf{l}_{ij}^* dy_{it-j} + \sum_{j=0}^{q-1} \mathbf{d}_{ij}^* dX_{it-j} + \mathbf{e}_{i,t};$$

with:

$$\mathbf{f}_i = -(1 - \sum_{j=1}^p \mathbf{l}_{ij}); \mathbf{q}_i = \sum_{j=0}^q \mathbf{d}_{ij} / \mathbf{f}_i; \mathbf{l}_{ij}^* = - \sum_{m=j+1}^p \mathbf{l}_{im};$$

$$\mathbf{d}_{ij}^* = - \sum_{m=j+1}^q \mathbf{d}_{im};$$

$$i = 1, \dots, N, \quad t = t_i^0, \dots, t_i^T.$$

The intercept term $\theta_{0,i}$ of equation (2) is absorbed in the country specific intercept in equation (3.4).

Ideally we would like to estimate equation (3.4) for each country separately and subsequently estimate the average long run elasticities. This approach is better known as a Mean Group Estimator (MGE, see, e.g. Swamy (1970)). However, as shown by Hsiao, Pesaran and Tahmiscoglu (1999), the MGE performs badly in small samples (both T and N are considered to be small in our case). An alternative is to *a priori* restrict all parameters in equation (3.4) to be the same across countries. This pooling of the data essentially imposes the restriction of slope homogeneity. Pesaran and Smith (1995) show that conventional estimators may yield inconsistent parameter estimates when in fact slope homogeneity does not hold. In our empirical application slope heterogeneity may arise from the fact that institutional settings are different across the countries. This causes countries to react differently to changes in, for instance, working hours or inflation in the short run.

An alternative estimator is suggested by Pesaran, Shin and Smith (1998). Basically, they assume the long-run effects to be constant across countries while the short-run effects are allowed to differ across countries. This they call the Pooled Mean Group (PMG) estimator. They discuss the asymptotic properties of PMG and show that PMG is simply doing a better job in relatively small samples compared to a MGE or a dynamic fixed effects. For this reason we choose to employ the PMG estimator. Effectively it means we impose the following restriction on equation (3.4):

$$(3.5) \quad \mathbf{q}_i = \mathbf{q}, \quad i=1, \dots, N.$$

Imposing restriction (3.5) on equation (3.4) yields the following equation:

(3.6)

$$dy_{i,t} = \mathbf{m}_i + \mathbf{g}_i' t + \mathbf{f}_i'(y_{i,t-1} - \mathbf{q}' X_{i,t}) + \sum_{j=1}^{p-1} \mathbf{I}_{ij}^* dy_{i,t-j} + \sum_{j=0}^{q-1} \mathbf{d}_{ij}^* dX_{i,t-j} + \mathbf{e}_{i,t}.$$

To estimate equation (3.6) an iterative estimation procedure as proposed by Pesaran, Shin and Smith (1998) is implemented. The parameters of interest for this paper are the long-run effects and the average speed of adjustment ($\phi = \sum_i \phi_i / n$). Given the long-run effects we are able to quantify the total effect of a change in working hours on the employment rate. Moreover, we can analyze the central role of the real wage rate in this. For each of the endogenous variables we estimate equation (3.6) using an Instrumental Variables estimator. The standard errors are calculated taking into account the possibility that the regressors are $I(1)$ and are corrected for heteroscedasticity. For consistency we need that all variables in the long-run relationship, equation (3.2), are cointegrated. This is equivalent with the testable assumption that the error term in equation (3.2) is stationary.

< Tables 2 and 3 >

3.3 Empirical results

Equation (3.6) is estimated for each of the three endogenous variables: Employment rate, Wage rate and Working hours. The exogenous variables are GNP, CPI and Share 15-65. Test statistics for the presence of a unit root in each of these variables are reported in Table 2. The results in Table 2 show that all series except Wage rate and Share 15-65 have a unit root, hence are non-stationary and integrated of order 1.

As discussed above, under the assumption that the variables entering the long-run relationship are cointegrated we can estimate equation (3.6) for each of the endogenous variables. The estimates of the long-run coefficients, the θ 's in equation (3.6), are reported in Table 3. For completeness, estimates of the country specific effects ($\mu_i + \theta_{0,i}$), trend (γ_i) and short-run parameters (λ_{ij}^* and δ_{ij}^*) are reported in Appendix B. For completeness, in Appendix B Mean Group estimates of the short-run parameters are reported. It is important to note that these estimates are only reliable when the number of countries is large. Since this is not the case we do not discuss the Mean Group estimates reported in Appendix B and restrict the discussion to the estimates of the long-run parameters.

Before turning to the estimation results we discuss briefly several model specification tests. Each equation of our system of three equations is estimated by means of an Instrumental Variables estimator. In order to satisfy the order and rank conditions for identification the following restrictions are imposed on the model: CPI is excluded from the employment rate and working hours equations, the population share between 15 and 65 is excluded from the wage rate and working hours equations. Furthermore, for the employment rate an ARDL(1,1), for the wage rate an ARDL(2,1) and for working hours an ARDL(2,1) are chosen, based on the model specification tests. Hence the second period lag of working hours is excluded from the employment rate and wage rate equations and the second period lag of the wage rate is excluded from the employment rate and working hours equations.

< Tables 4a, 4b and 4c >

The system is just identified. To validate the instruments employed we calculate for each endogenous variable the partial R^2 based on the excluded instruments in the first stage regressions per country. Overall the partial R^2 's reported in Table 4a are considered to be sufficiently large, hence we conclude that our additional instruments have sufficient explanatory power. Independence across time of the error term in equation (3.6) is a necessary condition for obtaining consistent parameter estimates. This condition can be satisfied by choosing the distributed lag in such a way that the model passes a test on serial correlation. The serial correlation test is based on the estimated residuals of equation (3.6) and the fact we employ an IV estimator is taken into account (see, e.g. Davidson and MacKinnon (1993), Chapter 10). The results of the serial correlation test are reported in Table 4b. Results not reported here clearly showed that a ARDL(1,1) representation for the real wage rate and working hours was not sufficient in order to pass the serial correlation tests. Choosing a ARDL(2,1) for the real wage rate and working hours solved the serial correlation problems. The results in Table 4b show that for virtually all countries the three equations pass the test of no serial correlation. The null-hypothesis is rejected at the 5% level in 3 out of 36 cases, which is fairly close to what one would expect if the null-hypothesis were true. Test results not reported here clearly show that the error terms are heteroscedastic and for this reason all standard errors are corrected for heteroscedasticity.

As mentioned above in the model outline, the two crucial assumptions we make are that a long-run relationship exists and equation (3.2) is a cointegrating relationship. A test of the

existence of a long-run relationship for each country is equivalent to testing the null-hypothesis $\phi_i=0$ for each country. A rejection of this null-hypothesis is in favor of the existence of a long-run relationship. The test results are reported in Table 4c and show we do not reject the null-hypothesis uniformly for each country and for each equation. However, for most countries we do reject the null-hypothesis for each equation and we conclude that overall the test results are in favor of the existence of a long-run relationship. Furthermore, the panel unit root tests on the error term in equation (3.2) (last row of Table 4c) are in favor of a cointegrating relationship for each of the equations.

The estimation results reported in Table 3 show that most coefficients are in line with the theoretical predictions as discussed in section 2. A 1% increase in the wage rate results in a 0.62% decrease in the employment rate and a 0.16% decrease in the working hours. A 1% increase in the employment rate, inducing a tighter labor market, results in a 0.41% increase in the wage rate. A 1% reduction in working hours results in a 0.38% increase in the employment rate and a 1.15% increase in the real wage rate. Furthermore, there is some evidence that a decrease in the employment rate may trigger a reduction in working hours. These are all partial effects and to analyze the total effects of a reduction in working hours on the employment rate we have to substitute the wage equation into the employment equation.

< Table 5 >

Table 5 sums up the total effects. The second column in Table 5 shows that a 1% reduction in working hours results, in the long run, in a 1.04% increase in the real hourly wage rate. This implies that weekly earnings of workers are fully compensated for the loss in working hours. This compensation totally annihilates partial effect of a decrease in working hours on the employment rate. The partial effect according to Table 3 was -.38. But the total effect according to Table 5, actually has the opposite sign: a 1% reduction in working hours results in a 0.27% decrease in the employment rate. This effect is found to be insignificant.

Thus, the picture emerges that a reduction in working hours causes an increase in the real wage rate and, consequently, annihilates positive a direct effect of a reduction in working hours on the employment rate (Table 3) and turns it into a (insignificant) negative effect (Table 5). The last column in Table 5 shows that changes in the employment rate and wage rate affect working hours in the long run. The empirical results stress the importance of taking the simultaneity between

employment rate, wage rate and working hours into account when addressing the effects of a reduction in working hours on the employment rate.

4. Concluding remarks

We have considered both the theoretical and the empirical case for worksharing as a policy to reduce unemployment or promote employment. The results from the literature are non-conclusive as to the efficacy of worksharing as a means to reduce unemployment.

Our empirical analysis does not provide any ground for the proposition that worksharing would reduce unemployment.

All this does not preclude that one would prefer earlier retirement or shorter hours as a means of consuming increased income in the form of additional leisure. To allow for such possibilities at an individual level may be welfare enhancing, just as it may be welfare enhancing to create possibilities for people to work longer hours and earn more, if they wish to do so. Also other arguments have been advanced in favor of worksharing, for instance that it would help the emancipation of women. These other arguments in favor of worksharing may be judged on their own merit and may form compelling reasons to work shorter hours or to retire earlier.

But if one wants to increase employment, other measures are probably much more effective than worksharing.

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Appendix A. A survey of public policy experiments with respect to worksharing

In this appendix we seek to outline various worksharing measures pursued in Europe, and the evaluations of these programs as carried out in different studies. Following the framework of section 2, we first provide a description of public policy experiments with respect to changes in working hours. This is followed by a description of the policy measures promoting early retirement and job sharing.

1. Shorter hours

In 1981, the *French* socialist government aimed at a reduction of normal working time per week from 40 to 35 hours within a period of 5 years. Underlying this policy was the belief that shorter working time at all levels would help to reduce unemployment. Initially, the working time was reduced from 40 to 39 hours a week, the paid leave was increased from 4 to 5 weeks, with full compensation for workers and restrictions on overtime. The program was pursued for one year and then was halted as a failure. Jallade (1991) documents the details of this government initiative of a reduction in working time. Jallade argues that any small employment benefit achieved was more than offset by the damage caused to competitiveness as a result of a rise in wage costs and the emergence of a “hiring-freeze” mentality amongst employers. He points to three crucial lessons to be drawn from the French experiment. *First*, any across-the-board restriction of the reduction in working time is ineffective because it is ill adapted to the circumstances in individual firms. *Second*, there are risks attached with accelerating a trend that reflects economic constraints. *Third*, there are practical difficulties in promoting employment through a reduction in the working week: if the reduction does not go far enough the result is higher productivity with no additional jobs, and if it goes too far, wages rise excessively. Jallade concludes that governments, rather than focusing on the relationship between working hours and employment, need to look at working time in the context of enhancing industrial competitiveness and should adopt other ways to create new jobs.

A proposal by the *Belgian* Government in 1979, to subsidize a reduction of the working week from 40 to 36 hours in combination with some “wage-moderation”, was rejected by employers and some unions. In the period from 1983 through 1986, Belgium initiated the so-called “3-5-3” plan in order to encourage employees to share work and firms to increase employment. In this plan, firms paid a 3% lower increase in wages and they were asked to reduce working time by 5% and increase employment by 3%. The objective was to create 75,000 jobs through negotiations at the sectoral level and at the level of individual firms. The program is reported to have created 23,000 jobs (relative to a labor force of roughly 2.9 million employees).

A related policy initiative was referred to as the “Hansenne experiments”, named after the Minister of Employment who set it up. These experiments sought to reorganize the working time of firms with a view to redistributing the work available. This was an experimental scheme that allowed deviations from legally established rules, implying that the problems such as the choice of normal working hours, weekly closing time and night shifts are to be resolved without any legal constraints at the individual firm level. The unions showed reservations to the success of these experiments, primarily because of the threat to the rights of labor that these experiments engender. According to Roche et al. (1996), the net job creation linked to these experiments was very limited.

De Rongé and Molitor (1991) have concluded their survey of Belgian experience with respect to changes in working hours by saying that “the reduction of working hours, which has been a central theme for mobilization of the working class movement, is today presented by trade unions in nearly identical terms to those used in the 1930s. This, in spite of the fact that the technical and organizational conditions of production have been transformed, along with the general cultural context of the work. In this context, one of the major difficulties of the trade unions has been their tendency to reply to new yearnings with old suggestions and formulas”.

In *the Netherlands*, a sharp increase in unemployment in the 1970s and a rapid rise in the size of the labor force in the 1980s provided the context for a centralized agreement between employers and trade unions in 1982. In this agreement a gradual reduction of working time per week was planned, and it was linked to the suspension of index-linked annual growth in wages. Although there were variations in the level of reductions in working time (ranging from a few days a year to a 36-hour working week), for most employees working time was reduced to 38-hours per working week. The Netherlands Central Bureau of Statistics estimated that by the end of 1984 about 72% of the nation's work force had experienced some form of reduction in working time. In August 1985, the Government reduced the working time for civil servants to 38-hours per week in the hope of sharing public employment. Moreover, the authorities decided that 30% of all vacancies that required no special work experience should be filled by persons working a maximum of 32 hours a week. It became common practice to employ workers younger than 26 for 32 hours per week.

However, in 1985 and especially in 1986, the labor unions and the political parties abandoned the reduction in working time as the most important policy initiative to combat unemployment. De Neubourg (1991) provides three main reasons for this. First, working time reductions did not generate as many new jobs as its defenders had hoped. On the basis of macroeconomic models he estimates that as a result of shorter working hours unemployment would decline only by 1% in the short run, and thus a reduction in working time is a relatively ineffective policy for reducing unemployment. Second, inflation in that period became nearly zero percent per year. Since reductions in working time were to be financed by foregoing the benefits of wage indexation, no inflation means that further reductions in working time can be financed only by diminishing nominal wages or by raising wage costs (measures which are unlikely to gain support from both workers and employers). Third, workers' support for a reduction in working time was never convincing and it declined further because of the disappointing employment effects and the minimal growth in wages.

In 1985, the Ministry of Social Affairs and Employment published results of a survey which analyzed the effects of shorter hours on employment. The survey covered 583 firms with more than 20 employees. The results show that in almost 80% of the firms some form of a reduction in working time was realized or planned. In 17% of these firms, new jobs were created and in another 26% new jobs were expected to be created. In about 7% of these firms jobs were said to have been saved, and in 6% of the firms jobs were expected to be saved. However, in 4.5% of the firms jobs were lost, and in another 4.5% jobs were expected to be lost in spite of the working time reduction. When asked about the reasons for low employment effects, 35% of these firms attributed it to productivity growth, 22% to overcapacity, 15% to the reduction of production time and 9% to reorganizational problems (De Neubourg (1991), p. 140). On the basis of this study and other research involving smaller firms, De Neubourg estimates that around 20 per cent of all lost hours had been replaced by new employment. Moreover, unemployment does not decline by the same number of persons as the number of newly created jobs, for two reasons. First, a reduction in working time leads to an increase in labor supply, and second, it is likely that people may also hold a second job as a consequence of a working time reduction.

In the view of Riechel (1986, p. 536): "the Dutch authorities emphasized (in the early 1980s) growth-oriented policies as well as policies that tend to reduce the relative price of labor and have considered worksharing schemes as only supplementary measures". De Neubourg (1991) concludes: "working time policy did not create a growth in employment that can be assumed to lower overt unemployment considerably". De Neubourg also concludes: "judged from workers' opinions and from the programs of labor unions and political parties, it seems most plausible that working time will not be reduced further in the years to come. Employers' organizations and labor unions are currently discussing wage claims and labor-market flexibility. These are now set to become the major issues in Dutch collective bargaining".

For *Germany*, the example of the steel industry (IG Metall) stands out. In 1984, IG Metall

succeeded in reducing the work week and achieved a drop from 40 to 38.5 hours a week. The subsequent drops reduced the working hours per week to 37.5 in 1987, 37 hours in 1989, 36 in 1993 and 35 in 1995 (for a detailed survey of changes in working hours, see Bosch (1990) and Blyton (1992)). In exchange, employers were allowed to allocate hours more flexibly. Moreover, it was agreed that there would be no renegotiation of working hours before 1998.

Seifert (1991) analyzes the extent to which working time reductions in Germany during the period 1984 to 1990 have contributed to rising employment. He provides a survey of twelve studies which estimated the employment effect of the reductions in working time in different time periods, and then uses the results of these studies to estimate the total employment effect exerted by all the working time reductions since 1985. In his view about 20% of all new employment (roughly 420,000 jobs out of the total 2.12 million new jobs) during the period in question can be attributed to reductions in standard working time. Seifert notes the discrepancy between increasing employment and decreasing unemployment figures in the years in question. The fact that the number of registered unemployed declined comparatively little between 1984 and 1990 is to be attributed to the considerable rise in labor supply which can also be attributed to the decline in working time. Seifert also refers to the report of the employers' association which concludes that "standard working time reductions are now considered an unsuitable, if not actually counterproductive, employment policy measure, because they act as a brake on growth and productivity". The employers maintain that without the higher wage increase (which would have been possible if working hours had not been reduced) demand is suffering from a decline in purchasing power which has led to a slower economic growth.

As mentioned earlier, Hunt (1996) examines the impact of the reduction in standard working hours in (West) Germany, and her conclusion substantiates the claim of trade unions that the reduction in working hours has been attained with full-compensation of loss in earnings. Hunt concludes by saying that "examination of wages and actual hours does not lead to an unambiguous prediction of the net effect on employment of reducing working hours". In Hunt (1999) only modest effects of worksharing in Germany are reported.

In 1979, workers in the *British* engineering industry started a series of 1- and 2-day national strikes in pursuit of a shorter working week. Although the initial demand was for a 35-hour week, the eventual settlement was a reduction for manual workers from 40 to 39 hours of work per week, and an increase in basic holiday entitlement to 5 weeks. As to employment effects, it appears that the reductions in working time were largely offset by increased overtime and higher productivity resulting from changes in technology and work pace (as noted by Roche et al. (1996)).

The subsequent 1989-90 dispute of the British shipbuilding and engineering unions secured a reduction in the standard working week to 37 hours. The agreement contained provisions which intended to defray some or all costs of the reduction in hours. As a result of this reduction in working hours, the productivity of workers increased substantially (as reported in Richardson and Rubin (1993), p. 41). However, the absolute number of people employed did not increase.¹⁰

Blyton (1992) notes that an important similarity between the British and German campaigns of workers for a reduction in working hours is that while both started their campaign in the engineering sector, there are clear signs that these shorter hours agreements subsequently served as the basis for a more widespread reduction in working time. In Germany, as noted by Bosch (1990), by 1989 almost nine out of every ten employees covered by collective agreements had a working week below 40. Similarly in Britain, there are indications that the agreements reached between the engineering

¹⁰ Among EU Member States, the United Kingdom has the largest number of average weekly hours. It is virtually unique in having little or no regulation concerning working time (as noted by Roche et al. (1996)).

unions and individual firms within the employers' federation sector have been mirrored in non-federated engineering companies (most notably, vehicle manufacturers) and in non-engineering sectors (as noted by Blyton (1992), p. 428).

2. Early retirement

In *France*, the first early retirement scheme was established in 1972, as a result of a tripartite agreement. The scheme "Contrats de Solidarité", which started in January 1982 and lasted for two years, was considered a big success (especially in industry) with respect to its take-up. This scheme consisted of contracts between the Government and business firms whereby the wage earners aged 55-59 were allowed to retire keeping 70% of their gross wages, provided they were replaced by new workers on a one-to-one basis. By the end of 1983, about 60% of all workers aged 60 or over had effectively retired under one guise or another, leaving room for the recruitment of nearly 210,000 additional workers (Jallade (1991), p. 73). However, as noted by Roche et al. (1996), some 50% of the replacements did not come from the ranks of the unemployed but were new entrants. The generous benefit package and high take-up contributed to high costs, leading the Government to cancel the scheme within three years of its duration. Jallade (1991) notes that the loss of valuable skills was also seen as a drawback.

In April 1983 the retirement age was lowered from 65 to 60. Since about 60% of all workers aged 60 or above already took retirement under "Contrats de Solidarité" and since the statutory age of 60 is the minimum age at which people are entitled to retire (provided they have completed a full career of 37.5 years), this 1983 policy initiative did not turn out to be a drastic step. No mandatory replacements were required for workers opting to retire after the age of 60. According to Jallade (1991), the direct employment effect of lowering the retirement age will be relatively small because the new policy substitutes for some of the early retirement schemes and also because in times of uncertainty firms are anxious to keep wage costs down and are therefore reluctant to replace experienced workers by new ones. However, the indirect effect on employment resulting from changes in work organization of firms and on increases in productivity may be considerable.

In the *United Kingdom*, the Job Release Scheme which was introduced in 1977 offers a weekly allowance to older workers retiring early, provided their employers replace them by an unemployed person. The allowance is paid until the age of normal retirement, and varies (from £48 to £61 per week) with family and health status. Participation in the program is entirely voluntary. The scheme had a relatively low cost per job created, and Government evaluations show that the majority of applicants were from semi-skilled and unskilled lower income groups with no access to company pension schemes. The take-up of this scheme was limited, partly because of high age limits and relatively low payments (see Roche et al. (1996)).

A method to reduce official unemployment figures is to count older unemployed workers among the retired. In 1983, regulations were introduced which allowed reclassification of older unemployed persons as retired. They received pensions instead of unemployment benefits and were no longer required to sign on. As mentioned in Roche et al. (1996), the growth of early retirement schemes was related to the development of "internal" labor markets and was part of employees' fringe benefit programs, rather than reflecting a response to employment promoting policies. It is mainly for this reason that early retirement programs were concentrated in administrative and managerial grades, and in certain types of industries and in the public sector.

In *Belgium*, women over 55 and men over 60 are eligible for early retirement pensions, with mandatory replacements by unemployed persons aged under 30. However, within individual private agreements it is allowed to depart from this age requirement for retirement by settling for a lower age. This relaxation allowed firms to use early retirement as a way to shed workers. Between 1976 and 1985 more than 500,000 workers were affected by this measure. This formula has not been very popular with older workers on whom it was imposed, but has generally been well accepted by

younger workers who saw it as a way to enhance their own job security (De Rongé and Molitor (1991)). One of the salient features of the early retirement program in Belgium is its high take-up. As a consequence, at present the Belgian labor force participation rate of people over 55 is among the lowest in the member countries of the European Union. The present approach combines phased early retirement and part-time work, with support from both employers and the State (Roche et al. (1996)).

In *Germany*, an agreement reached in February 1996 provides an increase in the minimum early retirement age for men from 60 to 63 over the period 1997-99. For women the early retirement age remains unchanged. This agreement arose because of the strain imposed on pension funds by the widespread use of employers of the early retirement programs to lay off workers. The State also provides incentives to encourage workers over 55 to take on part-time employment prior to retirement. In these provisions, the State provides 20% of the part-time wage of younger workers employed to substitute for older workers opting to work part-time.

In *the Netherlands*, the early retirement schemes guarantee an employee a benefit equal to about 70 to 80% of last earnings up to the age of 65. In these programs, the payment of early retirement pensions usually requires a complete withdrawal from the labor market. Moreover, these programs do not require any mandatory replacement for early retired workers. One of the conclusions which Drèze (1991) derives from the British, French, Dutch and Belgian experiences is that “a mandatory replacement provision seems to make a crucial difference in terms of job creation”. Drèze reports that in contrast to the very high replacement rates for countries with mandatory replacement for early retired workers (the UK, France and Belgium), for non-mandatory programs (as in the Netherlands) figures as low as 10 to 20% for replacement rates are mentioned.

As reported in Kapteyn and De Vos (1999), next to the early retirement schemes introduced in the 1980s two alternative exit routes out of the labor force have been, and still are, quantitatively important. The first of these is the disability insurance scheme, which has been used by both employers and employees to facilitate an early exit of employees from the labor force. The second exit route is through unemployment. The authors detail the strong incentives provided by the various exit schemes to retire early. Plausibly the dramatic fall in labor force participation among elderly workers in the Netherlands is due to these incentives. One implication of the strong financial incentives to retire early is that the schemes are very costly to society (they are essentially all financed on a pay-as-you-go basis). This may be expected to increase wage costs for all employees, and hence have adverse employment effects.

3. Job sharing and part-time work

In the *United Kingdom*, a Job-Splitting Scheme was introduced in 1982. This scheme offered a subsidy to splitting existing jobs, encouraging employers to create additional employment. In this scheme, incentives were provided to fill one full-time job by two unemployed persons, one employed and one unemployed person or two existing full-time workers changing to part-time work. The scheme has been criticized on several grounds. It only allowed employers to take on unemployed persons for fewer than 16 hours per week, the limit above which the workers become entitled to legal protection against unfair dismissal. Moreover, there were no pension rights protections and because the scheme offered incentives to employ unemployed people, it may have indirectly discriminated against those who voluntarily opt to shift from full-time work to part-time work.

A Part-Time Job Release Scheme introduced in 1983 allowed early retirees to phase their retirement by sharing their jobs with an unemployed person. The employers were given a grant to recruit such a person. Participation in this program was disappointing for some of the reasons mentioned above. Apparently, British employers showed little interest in the idea of job sharing, and coupled with the fact that trade unions did not show much enthusiasm for this idea either, the

idea of job sharing was not considered successful in the United Kingdom (Roche et al. (1996)).

In *France*, the “Contrats de Solidarité” scheme was replaced by a scheme offering incentives for half- time early retirement with replacement. That scheme, parallel to the British Job Splitting Scheme, was considered equally unsuccessful (Drèze (1985)).

In *Belgium*, job sharing has been combined with early retirement schemes and sabbatical leave, allowing for the recruitment of unemployed people to fill the posts on a part-time basis. In particular, the State promoted job sharing initiatives in the public sector with the aim of reducing unemployment. Employees in public administration work a reduced working week in their first year of employment, and people who are already employed can opt to cut their working time by 50%. In the education sector staff can work part-time before retirement: in this scheme employees over 50 years of age receive a reduction in their salary proportionate to the reduction in working time along with a bonus of 25% of their remaining salary if they do not take up any other job. Staff in local administration can also opt for part-time early retirement if they have been employed for at least 20 years, are aged over 55 and agree to retire at 60 (Roche et al. (1996)).

In *the Netherlands*, part-time work has greatly expanded. As a result, part-time working is much more common in the Netherlands than in other European countries. The Netherlands Central Planning Bureau has calculated that the growth of part-time work increased the number of employed by 300,000 between 1979 and 1990. This in itself is an interesting example of the fallacy underlying the conventional argument for worksharing, as the calculation is based on the notion that total employment in hours is given and that the increase in part-time work has led to a sharing of this total number of hours by more people. De Neubourg (1991) disagrees with the claim of the Government that work sharing (one form of which is part-time work) made significant contributions to employment growth. Nevertheless, in his view, the work sharing policies in the form of incentives for part-time work did help to redress the imbalance between male and female workers.

The overall conclusion of Freeman (1997) is that the work sharing programs in Europe did not have much success in generating employment. This conclusion is also shared by Drèze (1985) who views the European experience with worksharing policies as a confirmation of “theoretical warnings” about worksharing. The countries in which worksharing has been attempted already have work patterns in which extensive use is made of part-time work and have low levels of initial working time. According to Freeman (1997), the worksharing policy can be expected to have more potential for success in countries where the employees work long hours (such as Spain, Japan, the US and Canada).

Appendix B: Estimation Results

Tables B1, B2 and B3 report on the estimates of the country specific effects ($\mu_i + \theta_{0,i}$), trend (γ_i) and short-run parameters (λ_{ij}^* and δ_{ij}^*) of equation (3.6).

Table B1: Employment rate equation

Country	Constant	Trend	$\Delta(\text{Wage Rate})$	$\Delta(\text{Hours})$	$\Delta(\text{GNP})$	$\Delta(\text{Share1565})$
US	-0.76 (0.27)	-0.004 (0.001)	-0.05 (0.19)	1.04 (0.58)	0.04 (0.18)	0.20 (1.00)
JP	-0.24 (0.11)	-0.002 (0.001)	-0.10 (0.11)	0.27 (0.26)	0.08 (0.10)	-1.04 (0.47)
AU	-1.44 (0.42)	-0.008 (0.001)	0.12 (0.06)	0.15 (0.14)	-0.23 (0.05)	-1.34 (1.12)
NZ	-0.40 (0.22)	-0.003 (0.001)	-0.12 (0.13)	0.76 (0.59)	0.10 (0.15)	-0.93 (1.32)
BG	-0.014 (0.14)	-0.0003 (0.001)	-0.035 (0.10)	-0.10 (0.11)	0.31 (0.09)	-1.51 (0.58)
FR	-0.49 (0.16)	-0.004 (0.001)	0.09 (0.05)	-0.10 (0.08)	0.09 (0.04)	-0.15 (0.24)
BD	-1.01 (0.26)	-0.01 (0.001)	0.12 (0.11)	0.13 (0.10)	-0.16 (0.07)	-0.12 (0.27)
LX	0.06 (0.10)	0.003 (0.003)	-0.022 (0.08)	-0.15 (0.18)	0.05 (0.07)	0.21 (0.19)
NL	-0.74 (0.24)	-0.004 (0.001)	0.16 (0.08)	-0.10 (0.24)	-0.07 (0.09)	-1.52 (0.84)
PT	0.05 (0.07)	0.0003 (0.002)	0.05 (0.11)	0.50 (0.40)	0.02 (0.10)	0.20 (0.59)
ES	0.61 (0.36)	0.007 (0.003)	0.54 (0.19)	0.29 (0.14)	1.08 (0.17)	-2.68 (1.40)
UK	-1.08 (0.34)	-0.008 (0.001)	-0.10 (0.06)	-0.27 (0.16)	-0.03 (0.08)	0.81 (0.53)
Average (MGE)	-0.45 (0.13)	-0.003 (0.001)	0.06 (0.03)	0.20 (0.09)	0.11 (0.03)	-0.66 (0.24)

Table B2: Wage rate equation

Country	Constant	Trend	Δ (Wage one lagged rate) period	Δ (Employ- ment rate)	Δ (Hours)	Δ (GNP)	Δ (CPI)
US	0.28 (0.48)	-0.002 (0.002)	-0.08 (0.14)	-0.17 (0.27)	0.45 (0.79)	0.22 (0.24)	-0.38 (0.17)
JP	1.50 (0.54)	-0.005 (0.002)	-0.12 (0.19)	-0.71 (0.44)	-0.21 (0.53)	0.15 (0.21)	-0.06 (0.12)
AU	2.13 (0.74)	-0.002 (0.004)	-0.29 (0.24)	-0.92 (0.24)	-1.21 (1.19)	0.39 (0.40)	0.05 (0.51)
NZ	2.28 (1.13)	0.002 (0.004)	-0.12 (0.19)	-0.71 (0.60)	1.25 (1.69)	0.14 (0.35)	-0.006 (0.28)
BG	2.07 (0.70)	-0.005 (0.002)	-0.22 (0.16)	0.90 (0.35)	0.43 (0.22)	-0.64 (0.19)	0.21 (0.14)
FR	2.49 (0.88)	-0.004 (0.003)	-0.54 (0.25)	-2.03 (0.81)	-0.16 (0.35)	0.014 (0.21)	-0.24 (0.17)
BD	2.52 (0.47)	-0.004 (0.002)	-0.18 (0.11)	-0.12 (0.20)	0.18 (0.15)	-0.41 (0.12)	-0.87 (0.13)
LX	2.04 (0.76)	-0.011 (0.004)	0.48 (0.18)	1.03 (1.17)	1.55 (0.63)	-0.07 (0.17)	0.45 (0.40)
NL	2.61 (0.59)	-0.006 (0.002)	0.036 (0.11)	-0.32 (0.34)	-0.34 (0.54)	-0.49 (0.17)	-0.53 (0.15)
PT	0.96 (0.40)	-0.008 (0.003)	-0.06 (0.25)	0.58 (0.54)	-1.73 (0.77)	-0.31 (0.25)	-0.44 (0.44)
ES	1.17 (0.30)	-0.0001 (0.002)	-0.69 (0.13)	0.30 (0.17)	0.04 (0.12)	-0.22 (0.16)	0.25 (0.18)
UK	2.69 (1.20)	-0.002 (0.004)	0.35 (0.21)	-0.96 (0.38)	-1.47 (0.58)	0.42 (0.47)	-0.51 (0.46)
Average (MGE)	1.90 (0.45)	-0.004 (0.002)	-0.12 (0.06)	-0.26 (0.16)	-0.10 (0.22)	-0.07 (0.08)	-0.17 (0.09)

Table B3: Working hours equation

Country	Constant	Trend	$\Delta(\text{Hours})$ one Period lagged	$\Delta(\text{Employment}$ rate)	$\Delta(\text{Wage}$ rate)
US	0.008 (0.54)	0.0004 (0.0007)	-0.23 (0.19)	0.17 (0.06)	0.11 (0.05)
JP	-0.28 (0.77)	-0.0014 (0.0004)	0.12 (0.25)	0.80 (0.35)	-0.37 (0.13)
AU	3.06 (0.91)	-0.001 (0.001)	-0.04 (0.18)	0.01 (0.09)	0.06 (0.05)
NZ	1.04 (0.72)	0.0005 (0.0002)	0.03 (0.21)	0.15 (0.08)	0.05 (0.04)
BG	5.73 (1.27)	-0.005 (0.001)	0.35 (0.25)	-0.04 (0.36)	0.52 (0.25)
FR	2.99 (0.71)	-0.0007 (0.0005)	0.58 (0.21)	-0.14 (0.16)	0.58 (0.15)
BD	4.50 (0.86)	-0.0009 (0.0005)	0.29 (0.16)	0.72 (0.16)	-0.46 (0.12)
LX	3.77 (0.69)	0.0008 (0.0005)	0.33 (0.15)	-0.44 (0.37)	0.38 (0.10)
NL	3.82 (0.75)	-0.001 (0.0003)	0.56 (0.14)	-0.06 (0.08)	-0.02 (0.05)
PT	4.50 (0.77)	-0.006 (0.001)	0.13 (0.12)	0.42 (0.12)	0.12 (0.05)
ES	5.65 (1.51)	-0.005 (0.002)	0.31 (0.21)	-0.45 (0.20)	-0.03 (0.17)
UK	1.66 (0.71)	0.0014 (0.0004)	-0.50 (0.17)	0.43 (0.11)	-0.12 (0.06)
Average (MGE)	3.04 (0.26)	-0.0015 (0.0003)	0.16 (0.05)	0.13 (0.06)	0.07 (0.04)

Table 1: Observation period per country.

Country	Abbreviation	Period of observation	Number of observations
United States.	US	1971-1994	24
Japan	JP	1971-1993	23
Australia	AU	1971-1993	23
New-Zealand	NZ	1971-1994	24
Belgium	BG	1971-1993	23
France	FR	1971-1993	23
West-Germany	BD	1971-1990	20
Luxembourg	LX	1971-1993	23
Netherlands	NL	1971-1993	23
Portugal	PT	1971-1993	23
Spain	ES	1977-1992	16
United Kingdom	UK	1973-1993	21
Total number of observations			266

Table 2: Panel Unit Root tests, Im *et al.* (1997). H_0 : series has a unit root.

	t-bar statistics	Critical value, 5%	Conclusion
Employment rate	-2.60	-2.61	I(1)
Wage rate	-3.27	-2.49	-
Working hours	-2.24	-2.61	I(1)
Gross National Product	-2.45	-2.49	I(1)
Consumer Price Index	-1.44	-2.49	I(1)
Share 15-65	-3.17	-2.61	-

Table 3: Long-run relationships ^a.

Partial elasticities	Employment Rate	Wage Rate	Working Hours
Employment Rate	-	0.41 (0.30)	0.18 (0.02)
Wage Rate	-0.62 (0.07)	-	-0.16 (0.02)
Working Hours	-0.38 (0.22)	-1.15 (0.21)	-
Gross National Product	1.58 (0.14)	0.98 (0.17)	-
Share 15-65	0.21 (0.23)	-	-
Consumer Price Index	-	-0.10 (0.06)	-
R^2 ^b	0.70	0.66	0.68

^aStandard errors in parentheses^bThe R^2 pertains to equation (6).

Table 4a: Partial R^2 of the first stage regressions of the IV estimation procedure.

Country	Wage rate	working hours	employment rate
US	0.78	0.43	0.73
JP	0.32	0.30	0.53
AU	0.26	0.23	0.40
NZ	0.03	0.59	0.82
BG	0.51	0.15	0.51
FR	0.40	0.73	0.30
BD	0.99	0.66	0.37
LX	0.16	0.25	0.42
NL	0.60	0.74	0.33
PT	0.57	0.36	0.28
ES	0.99	0.99	0.80
UK	0.56	0.61	0.41

Table 4b: Serial correlation test. H_0 : no serial correlation.

Country	employment rate	wage rate	working hours
US	-0.05	2.01	0.73
JP	0.52	-0.30	0.96
AU	0.35	-0.25	0.51
NZ	1.31	0.18	0.85
BG	1.26	1.11	-0.55
FR	-0.91	-0.05	1.98
BD	-0.32	-0.20	0.45
LX	0.04	-3.08	0.89
NL	-0.14	-0.59	-1.86
PT	0.99	1.29	-1.28
ES	-0.36	-0.04	-0.73
UK	0.37	0.11	0.24

Critical value: 1.96.

Table 4c: Adjustment coefficients, the ϕ_i 's in equation (6)^a and the results of a cointegration test on the long-term relationship.

Country	employment rate	wage rate	Working hours
US	-0.26 (0.07)	-0.05 (0.09)	-0.01 (0.12)
JP	-0.09 (0.03)	-0.29 (0.10)	0.07 (0.17)
AU	-0.47 (0.05)	-0.44 (0.14)	-0.70 (0.21)
NZ	-0.13 (0.06)	-0.47 (0.19)	-0.23 (0.16)
BG	-0.01 (0.05)	-0.41 (0.08)	-1.29 (0.28)
FR	-0.17 (0.03)	-0.49 (0.15)	-0.66 (0.15)
BD	-0.36 (0.05)	-0.48 (0.08)	-0.99 (0.19)
LX	0.03 (0.05)	-0.37 (0.10)	-0.83 (0.15)
NL	-0.24 (0.04)	-0.49 (0.10)	-0.83 (0.16)
PT	0.02 (0.03)	-0.15 (0.07)	-0.99 (0.17)
ES	0.21 (0.11)	-0.22 (0.03)	-1.24 (0.33)
UK	-0.38 (0.05)	-0.52 (0.19)	-0.38 (0.15)
Overall ^b	-0.15 (0.05)	-0.37 (0.11)	-0.67 (0.19)
Cointegration test statistic ^c	-3.62	-2.93	-3.20

^a Standard errors in parentheses

^b Mean Group Estimator

^c Critical value: -2.61, H_0 : no cointegration.

Table 5: Long-run elasticities ^a.

Elasticity	Employment Rate	Wage Rate	Working Hours
Employment Rate	-	0.25 (0.37)	0.14 (0.06)
Wage Rate	-0.52 (0.08)	-	-0.25 (0.03)
Working Hours	0.27 (0.22)	-1.04 (0.19)	-

^a Standard errors in parentheses

Figure 1: Employment rate per country.

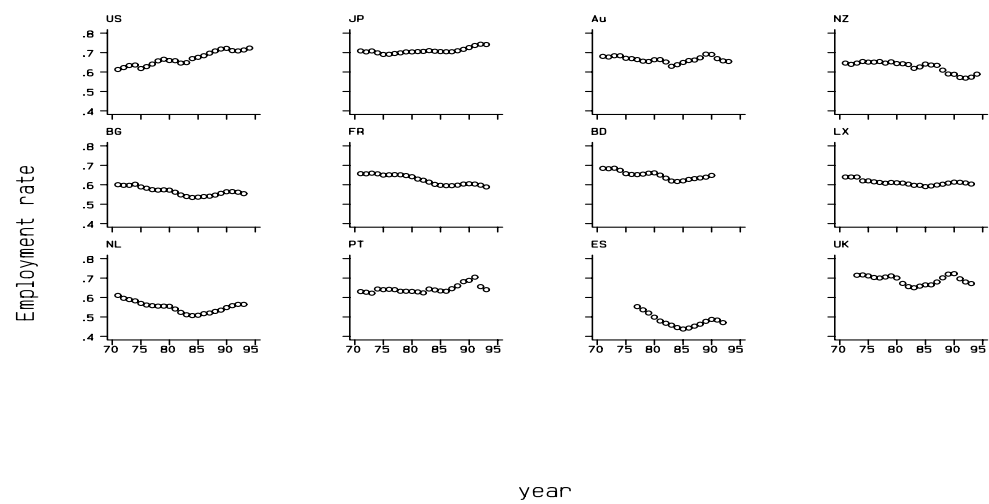


Figure 2: The real hourly wage rate per country (indexed, 1990=100).

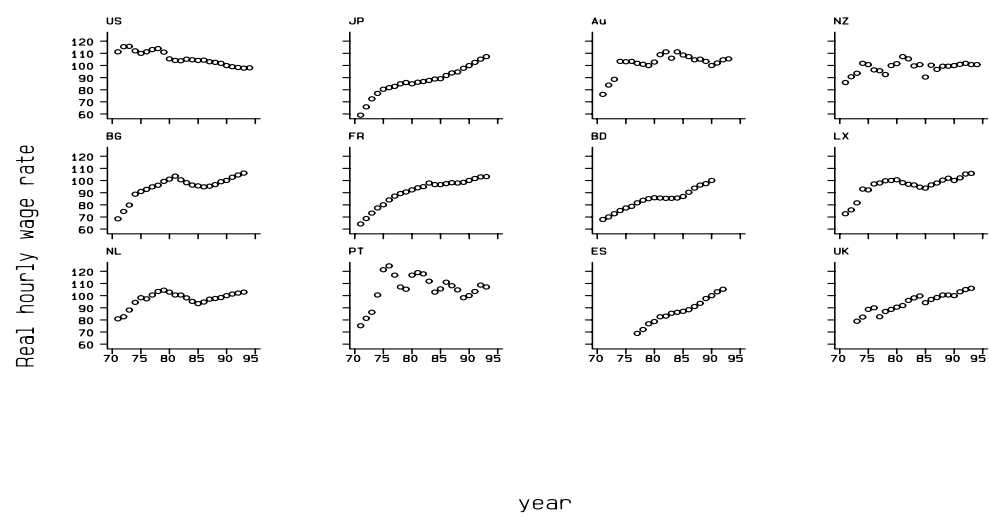


Figure 3: Weekly hours of work per country.

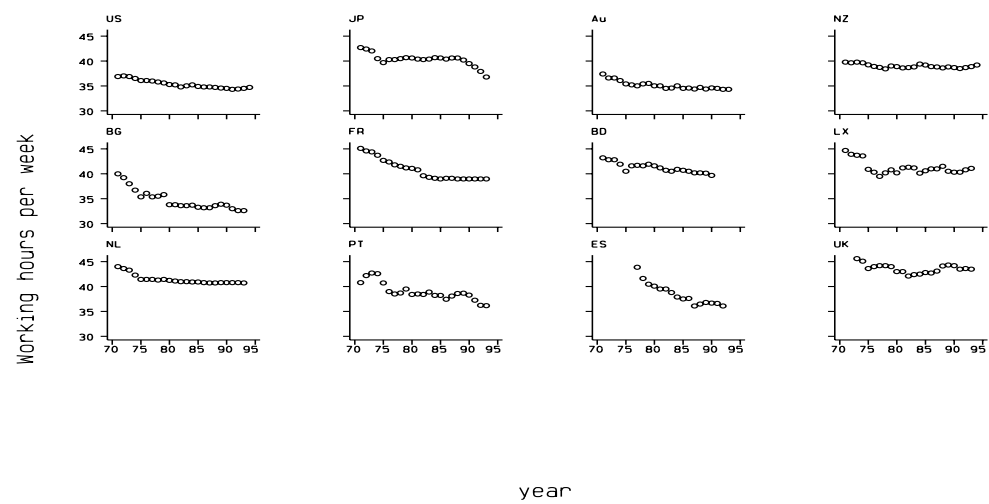


Figure 4: Real per capita GNP per country (indexed, 1990=100).

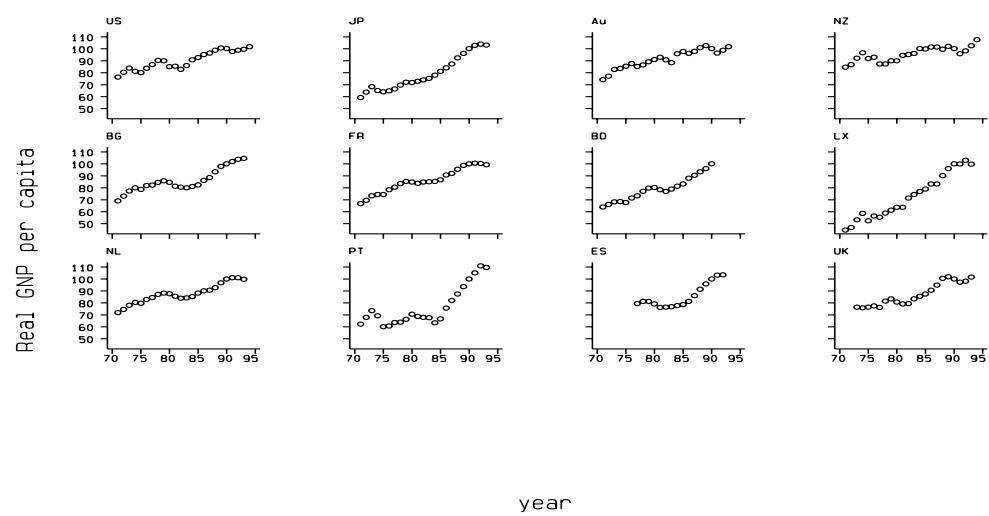


Figure 5: Consumer Price Index per country (1990=100).

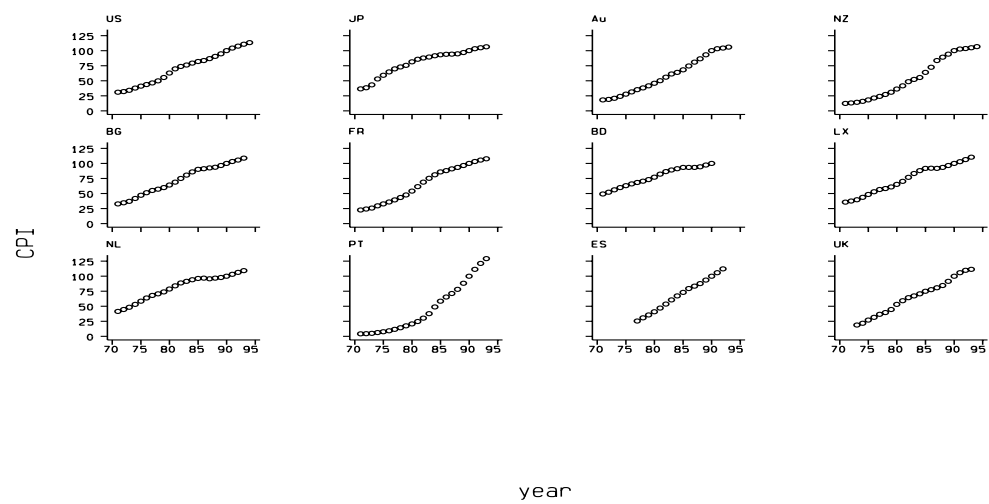


Figure 6: The share of the population between 15 and 65 years of age.

